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Upravljanje zagotovitljivosti - 3-11. del: Navodilo za uporabo - Vzdrževanje s poudarkom na zanesljivosti (IEC 60300-3-11:2009)

Dependability management - Part 3-11: Application guide - Reliability centred maintenance (IEC 60300-3-11:2009)

Zuverlässigkeitsmanagement - Teil 3-11: Anwendungsleitfaden - Auf die Funktionsfähigkeit bezogene Instandhaltung (IEC 60300-3-11:2009)

Gestion de la sûreté de fonctionnement - Partie 3-11: Guide d'application - Maintenance basée sur la fiabilité (CEI 60300-3-11:2009)

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EUROPEAN STANDARD
NORME EUROPÉENNE
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EN 60300-3-11

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English version

**Dependability management -
Part 3-11: Application guide -
Reliability centred maintenance
(IEC 60300-3-11:2009)**

Gestion de la sûreté de fonctionnement -
Partie 3-11: Guide d'application -
Maintenance basée sur la fiabilité
(CEI 60300-3-11:2009)

Zuverlässigkeitsmanagement -
Teil 3-11: Anwendungsleitfaden -
Auf die Funktionsfähigkeit bezogene
Instandhaltung
(IEC 60300-3-11:2009)

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This European Standard was approved by CENELEC on 2009-09-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: Avenue Marnix 17, B - 1000 Brussels

Foreword

The text of document 56/1312/FDIS, future edition 2 of IEC 60300-3-11, prepared by IEC TC 56, Dependability, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60300-3-11 on 2009-09-01.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2010-06-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2012-09-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60300-3-11:2009 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61164	NOTE	Harmonized as EN 61164:2004 (not modified).
IEC 61649	NOTE	Harmonized as EN 61649:2006 (not modified).
IEC 61709	NOTE	Harmonized as EN 61709:1998 (not modified).
IEC 62308	NOTE	Harmonized as EN 62308:2006 (not modified).
ISO 9000	NOTE	Harmonized as EN ISO 9000:2005 (not modified).

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050-191	1990	International Electrotechnical Vocabulary (IEV) - Chapter 191: Dependability and quality of service	-	-
IEC 60300-3-2	- ¹⁾	Dependability management - Part 3-2: Application guide - Collection of dependability data from the field	EN 60300-3-2	2005 ²⁾
IEC 60300-3-10	- ¹⁾	Dependability management - Part 3-10: Application guide - Maintainability	-	-
IEC 60300-3-12	- ¹⁾	Dependability management - Part 3-12: Application guide - Integrated logistic support	EN 60300-3-12	2004 ²⁾
IEC 60300-3-14	- ¹⁾	Dependability management - Part 3-14: Application guide - Maintenance and maintenance support	EN 60300-3-14	2004 ²⁾
IEC 60812	- ¹⁾	Analysis techniques for system reliability - Procedure for failure mode and effects analysis (FMEA)	EN 60812	2006 ²⁾

¹⁾ Undated reference.

²⁾ Valid edition at date of issue.

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Dependability management –
Part 3-11: Application guide – Reliability centred maintenance

Gestion de la sûreté de fonctionnement –
Partie 3-11: Guide d'application – Maintenance basée sur la fiabilité

INTERNATIONAL
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

DEPENDABILITY MANAGEMENT –

Part 3-11: Application guide –
Reliability centred maintenance

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 60300-3-11 has been prepared by IEC technical committee 56: Dependability.

This second edition cancels and replaces the first edition, published in 1999, and constitutes a technical revision.

The previous edition was based on ATA1-MGS-3; whereas this edition applies to all industries and defines a revised RCM algorithm and approach to the analysis process.

¹ The Air Transport Association of America.

The text of this standard is based on the following documents:

FDIS	RVD
56/1312/FDIS	56/1320/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

A list of all parts in the IEC 60300 series, under the general title *Dependability management* can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be:

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

Reliability centred maintenance (RCM) is a method to identify and select failure management policies to efficiently and effectively achieve the required safety, availability and economy of operation. Failure management policies can include maintenance activities, operational changes, design modifications or other actions in order to mitigate the consequences of failure.

RCM was initially developed for the commercial aviation industry in the late 1960s, resulting in the publication of ATA-MGS-3 [1]². RCM is now a proven and accepted methodology used in a wide range of industries.

RCM provides a decision process to identify applicable and effective preventive maintenance requirements, or management actions, for equipment in accordance with the safety, operational and economic consequences of identifiable failures, and the degradation mechanism responsible for those failures. The end result of working through the process is a judgement as to the necessity of performing a maintenance task, design change or other alternatives to effect improvements.

The basic steps of an RCM programme are as follows:

- a) initiation and planning;
- b) functional failure analysis;
- c) task selection;
- d) implementation;
- e) continuous improvement.

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All tasks are based on safety in respect of personnel and environment, and on operational or economic concerns. However, it should be noted that the criteria considered will depend on the nature of the product and its application. For example, a production process will be required to be economically viable, and may be sensitive to strict environmental considerations, whereas an item of defence equipment should be operationally successful, but may have less stringent safety, economic and environmental criteria.

Maximum benefit can be obtained from an RCM analysis if it is conducted at the design stage, so that feedback from the analysis can influence design. However, RCM is also worthwhile during the operation and maintenance phase to improve existing maintenance tasks, make necessary modifications or other alternatives.

Successful application of RCM requires a good understanding of the equipment and structure, as well as the operational environment, operating context and the associated systems, together with the possible failures and their consequences. Greatest benefit can be achieved through targeting of the analysis to where failures would have serious safety, environmental, economic or operational effects.

² Figures in square brackets refer to the bibliography.

DEPENDABILITY MANAGEMENT –

Part 3-11: Application guide – Reliability centred maintenance

1 Scope

This part of IEC 60300 provides guidelines for the development of failure management policies for equipment and structures using reliability centred maintenance (RCM) analysis techniques.

This part serves as an application guide and is an extension of IEC 60300-3-10, IEC 60300-3-12 and IEC 60300-3-14. Maintenance activities recommended in all three standards, which relate to preventive maintenance, may be implemented using this standard.

The RCM method can be applied to items such as ground vehicles, ships, power plants, aircraft, and other systems which are made up of equipment and structure, e.g. a building, airframe or ship's hull. Typically, equipment comprises a number of electrical, mechanical, instrumentation or control systems and subsystems which can be further broken down into progressively smaller groupings, as required.

This standard is restricted to the application of RCM techniques and does not include aspects of maintenance support, which are covered by the above-mentioned standards or other dependability and safety standards.

2 Normative references

[SIST EN 60300-3-11:2010](#)

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IEC 60050-191:1990, *International Electrotechnical Vocabulary – Chapter 191: Dependability and quality of service*

IEC 60300-3-2, *Dependability management – Part 3-2: Application guide – Collection of dependability data from the field*

IEC 60300-3-10, *Dependability management – Part 3-10: Application guide – Maintainability*

IEC 60300-3-12, *Dependability management – Part 3-12: Application guide – Integrated logistic support*

IEC 60300-3-14, *Dependability management – Part 3-14: Application guide – Maintenance and maintenance support*

IEC 60812, *Analysis techniques for system reliability – Procedure for failure mode and effects analysis (FMEA)*

3 Terms, definitions and abbreviations

For the purposes of this document, the terms and definitions of IEC 60050-191 apply, together with the following.

3.1 Definitions

3.1.1

age exploration

systematic evaluation of an item based on analysis of collected information from in-service experience to determine the optimum maintenance task interval

NOTE The evaluation assesses the item's resistance to a deterioration process with respect to increasing age or usage.

3.1.2

criticality

severity of effect of a deviation from the specified function of an item, with respect to specified evaluation criteria

NOTE 1 The extent of effects considered may be limited to the item itself, to the system of which it is a part, or range beyond the system boundary.

NOTE 2 The deviation may be a fault, a failure, a degradation, an excess temperature, an excess pressure, etc.

NOTE 3 In some applications, the evaluation of criticality may include other factors such as the probability of occurrence of the deviation, or the probability of detection.

3.1.3

damage-tolerant

capable of sustaining damage and continuing to function as required, possibly at reduced loading or capacity

3.1.4

failure (of an item)

loss of ability to perform as required

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3.1.5

failure effect

consequence of a failure mode on the operation, function or status of the item

3.1.6

failure management policy

maintenance activities, operational changes, design modifications or other actions in order to mitigate the consequences of failure

3.1.7

function

intended purpose of an item as described by a required standard of performance

3.1.8

failure mode

manner in which failure occurs

NOTE A failure mode may be defined by the function lost or the state transition that occurred.

3.1.9

failure-finding task

scheduled inspection or specific test used to determine whether a specific hidden failure has occurred

3.1.10

functional failure

reduction in function performance below desired level

3.1.11**hidden failure mode**

failure mode whose effects do not become apparent to the operator under normal circumstances

3.1.12**indenture level**

level of subdivision of an item from the point of view of a maintenance action

NOTE 1 Examples of indenture levels could be a subsystem, a circuit board, a component.

NOTE 2 The indenture level depends on the complexity of the item's construction, the accessibility to subitems, skill level of maintenance personnel, test equipment facilities, safety considerations, etc.

[IEV 191-07-05:1990]

3.1.13**inspection**

identification and evaluation of the actual condition against a specification

3.1.14**maintenance action**

maintenance task

sequence of elementary maintenance activities carried out for a given purpose

NOTE Examples include diagnosis, localization, function check-out, or combinations thereof.

3.1.15 item

part, component, device, subsystem, functional unit, equipment or system that can be individually considered

NOTE 1 An item may consist of hardware, software or both, and may also, in particular cases, include people. Elements of a system may be natural or man-made material objects, as well as modes of thinking and the results thereof (e.g. forms of organization, mathematical methods and programming languages).

NOTE 2 In French the term "entité" is preferred to the term "dispositif" due to its more general meaning. The term "dispositif" is also the common equivalent for the English term "device".

NOTE 3 In French the term "individu" is used mainly in statistics.

NOTE 4 A group of items, e.g. a population of items or a sample, may itself be considered as an item.

NOTE 5 A software item may be a source code, an object code, a job control code, control data, or a collection of these.

3.1.16**maintenance concept**

interrelationship between the maintenance echelons, the indenture levels and the levels of maintenance to be applied for the maintenance of an item

3.1.17**maintenance echelon**

position in an organization where specified levels of maintenance are to be carried out on an item

NOTE 1 Examples of maintenance echelons are: field, repair shop, and manufacturer.

NOTE 2 The maintenance echelon is characterized by the level of skill of the personnel, the facilities available, the location, etc.

[IEV 191-07-04:1990]